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# A Computer Simulation Model for Prediction of Voting in the U.N.

DOROTHY DODGE\*

This paper discusses an attempt to design a computer based simulation model that would be predictive of voting behavior of the 127 members of the United Nations.

## The Use of Computer Simulation

Simulations have been defined by Martin (1968) as models of system processes or outcomes having the purpose of clarification or explanation of underlying system variables and by Hamilton et al (1967) as models representing symbolically certain aspects of social, political or psychological system processes. A computer simulation represents an attempt to program a theory or system model for computer analysis. Social science models frequently are based upon structures involving tentative hypotheses or intuitive explication of parameters or variables, and computer simulation models permit the labored analyses often necessary for theory-building and theory-testing.

Although simulation models have a variety of purposes, theory-building or theory-testing is a frequent usage. Harold Guetzkow observes that limited existence of theory in the field of social science has "... led some political scientists to the use of simulation as a theoretical tool. It is through simulation that we may examine possible relationships among any or all variables that we are able to put into the simulation; that is, we can use simulation as a *theory-building* device. Further, we can use simulation as a *theory-comparing* device since by changing the variables and relationships among them we can generate the consequences of different theories."

Necessarily, computer simulations should replicate as accurately as possible the referent or "real world" system or theory to be analyzed. Sydney Verba notes: "The process of designing a simulation forces the designer to explicate his model of international relations. At times this may involve not so much the creation of new perspectives on the subject as the explication of traditional wisdom. One is forced to make explicit what may have been the implicit assumptions about the subject matter—in order that these assumptions may be placed in the operating model."

Charles Herman also stresses explication: "In designing a game or simulation, the designer is required to be explicit about the nature and relationships between the units in the operating model and their counterparts in the observable universe. He must specify the conditions which cause a relationship to vary."

Although many analyses of U.N. voting behavior, in particular bloc and caucusing group behavior, have been undertaken, the explication of voting behavior variables

and their relationship to each other is a more difficult problem about which little research has been done. The first attempt at modeling a U.N. roll call simulation programmed a group of variables based upon literature on the bloc or caucusing group. The testing of the validity of the use of these variables and their relationship to each other involves comparison with "real world" counterparts.

Prediction reliability of the model is one method that may be employed to compare model operation and outcomes to the "real world" system. The test of model reliability is the correspondence between model output (prediction of nation-state votes) and the "real world" systems (actual roll call votes in the General Assembly). If the simulation does not program essential attributes of the referent system, the simulation output should not indicate with high accuracy the voting behavior of the U.N. system. Prediction accuracy, then, will be used as a primary measure of model validity.

## Model Construction

In undertaking construction of a prediction model, previous attempts at simulation rollcall prediction as well as literature on U.N. voting behavior were surveyed. No reliable U.N. voting prediction model exists, but a number of legislative rollcall simulations have shown significant predictive reliability. One example is the model by Cleo H. Cherryholmes and Michael J. Shapiro for prediction of voting in the U.S. House of Representatives. Input variables such as party, constituency, and committee were used. Cherryholmes and Shapiro grouped "propositions concerning the determinants of rollcall voting behavior" into PREDISPOSITION and COMMUNICATION phases in order to build a theoretical model that replicated significant aspects of the 'real world' legislative processes." (Fig. 1)

In the PREDISPOSITION PHASE of the model "propositions drawn from social-psychological studies of attitude formation in general and legislative research in particular" were employed as the essential determinants of the voting predispositions that "emerge from the cognitions of representatives confronted with legislation." Congressional rollcall studies were surveyed to find data relating legislative voting behavior to discrete, explanatory variables. The variables included in the model were: 1) party affiliation; 2) constituency type; 3) section or region, and 4) individual characteristics.

The COMMUNICATION PHASE contains propositions drawn from legislative research concerning the "likelihood of communicative interaction between various types of legislators," and propositions drawn from re-



search concerning possible attitude alteration occurring from interactions between individuals with different predispositions.

The communication phase attempts to program types of confrontations that a legislator is likely to face when he has not developed a strong predisposition to vote for or against a given bill.

The variables are based upon the frequency of interactions between representatives in positions of leadership seeking to inform or exert influence on certain types of bills. Each representative is described in terms of his party, state, region, constituency characteristics, leadership positions, committee memberships, rank on each committee, and seniority.

#### **U.N. Model Based on Legislative Roll Call Model**

The first attempt at modeling a United Nations voting simulation was based upon modification of the Cherryholmes and Shapiro legislative model (Figure 2). Modifications included UN data rather than that for the House of Representatives. The variables included in the predisposition and communication phases are described below.

#### **PREDISPOSITION PHASE:**

Status variables employed for the member of the United Nations.

**BLOC** — A bloc is described as a group showing high voting agreement on all or most issues before the UN. Only one group, the East European Communist, fits this description. Although there are other caucusing groups in the UN, their voting cohesion is limited. Other caucusing groups therefore will be considered only in the communications phase.

**COLD WAR POSITION** — On some issues East-West confrontation has been a significant consideration in the voting behavior of nations. Members of NATO, ANZUS and SEATO are coded as Western, members of the Warsaw Pact as Eastern, and nations belonging to none of these alliances as Third World.

**REGION** — The geographic location of a nation may be a factor in voting behavior on some issues that come before the UN. Nations are classified according to the following regions: Africa, Asia, East Europe, North Atlantic, Latin America, and Oceania.

**SOCIO-CULTURAL PATTERN** — Certain social and cultural factors such as economic development, communism, size, religious culture, and the intensiveness of agricultural land use, have been combined into a classification scheme by Bruce Russett.<sup>8</sup> Countries are classified according to the following schedule: Afro-Asian, Western Community, Latin America, Semi-developed Latins, Eastern Europe, and unclassifiable.

**COLONIALISM** — Colonialism and imperialism may have an influence upon voting patterns in the UN. For example the African states have opposed

voting positions taken by states such as Portugal, France and Belgium. For purposes of coding nations that have been ruled by another since World War II are considered anti-colonial; nations that have held colonies since World War II are classed pro-colonial, and nations that have neither ruled nor been ruled during that time period, no position.

**ECONOMIC DEVELOPMENT** — Many of the questions considered by the General Assembly involve aid to developing areas or financing of U.N. special programs or peace-keeping. The level of economic development of a state may be a factor in U.N. voting behavior. Nations are coded as high, medium, low, or very low, employing the analysis found in the Banks and Textor study, *A Cross-Polity Survey*.

**NATIONAL IDEOLOGY** — Nations are likely to vote in the same direction on issues of similar content. A coding of past voting behavior may be helpful in predicting future roll call action. Such a past history can be quantified by classifying each resolution and computing the magnitude and direction of previous behavior concerning similar issues. The Rice Beyle pair agreement study<sup>9</sup> of U.N. roll calls for 1960-1965 was used to construct the past voting history.

#### **COMMUNICATIONS PHASE:**

The following are factors that may be significant to communication patterns in the United Nations General Assembly.

**CAUCUSING GROUP** — Within the General Assembly there are groups of nations that meet regularly to discuss issues and share information on questions before the U.N. These caucusing groups serve as one form of communication for the member nations. Some nations belong to more than one caucusing group. Listed below are the main caucusing groups and their respective sub-groups.

- The Afro-Asian Group
  - The OAU
  - The Brazzaville group
  - The Casablanca group
  - The Asian Group
    - The SEATO cluster
    - The non-aligned core
  - The Arab Group
- The Latin American Group
- Western Europe and Other States
  - Benelux
  - The Scandinavian group
- The Communist Bloc
- The Commonwealth

**TRADE PATTERNS** — A nation may have a special relationship to nations with which it trades extensively. A pattern of influence may be indicated quantitatively by considering the percentage of a nation's total trade that involves another state. Total trade was determined by adding the value of all the imports and exports of each nation for one year. Trade amounting to more than five percent of this total with any one nation was considered significant.

**INFLUENCE** — There are many factors that de-

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Figure 1. The Two Phases of the Model

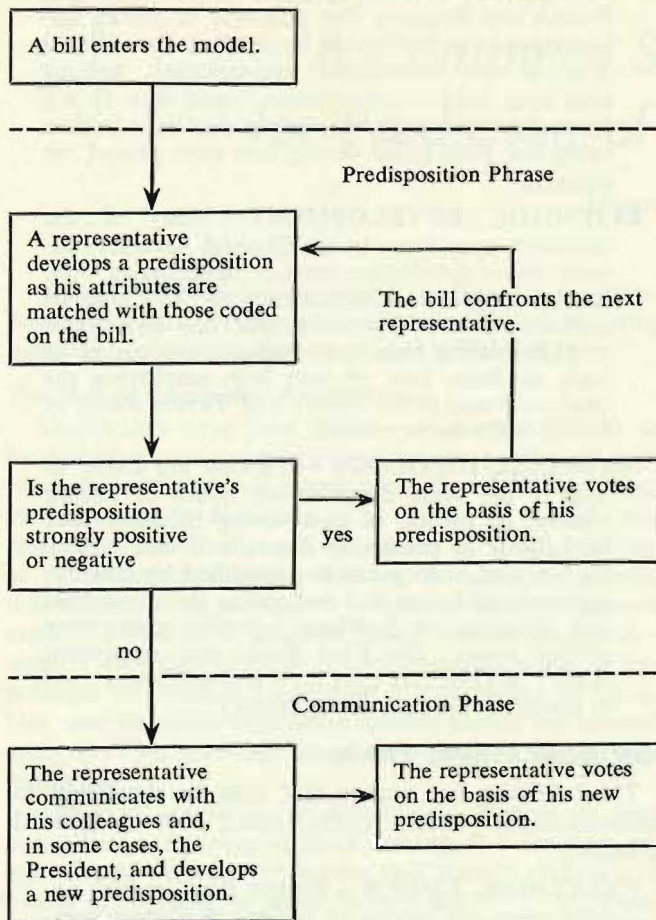
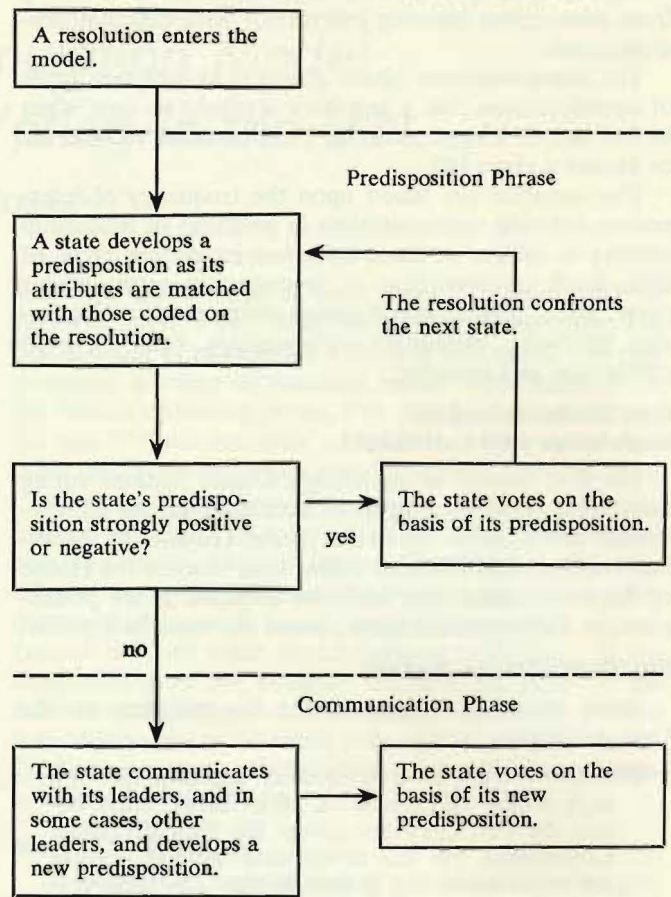


Figure 2. The Two Phases of the Model (revised)



termine influence in the General Assembly; one of the most easily quantifiable is the percentage of the U.N. budget that a nation is assessed. This factor is recorded as the percentage of the total U.N. budget for a single year.

After these revisions in input variables were made for the legislative rollcall simulation model, the predisposition and communication phases were run in an attempt to predict United Nations General Assembly rollcall votes for the 1965, 1966, and 1967 sessions. Since the U.N. has been likened to a parliamentary body in some contemporary literature, this adaptation of a legislative model permits some opportunity to test the parliamentary theory. On the predisposition phase of the model, prediction reliability reached 74 percent for all rollcalls. A further adjustment of the legislative model was necessary to allow for abstentions, which are less frequent in legislative bodies than in the United Nations. Abstentions were predicted if the weights ranged from  $-.5$  to  $+.5$  rather than the  $.0$  of the legislative model. Analysis of predicted and actual rollcall votes for each U.N. member revealed that the predisposition phase was more reliable in predicting the votes of members from developing and non-Western nations and least reliable for developed, Western and particularly West European states. The model also showed greater error in prediction of East-

West votes of the West European states and was more accurate for North-South issues.

Rather than following the legislative model pattern of a shunt-out of all legislative members receiving a prescribed weighting in the predisposition phase, all U.N. members were included in the communication phase of the model. Reliability of rollcall prediction dropped to 55 percent after the communication phase. The results suggest either that the variables programmed in the communication phase, i.e., caucusing group membership, trade partners and influence weights, are not as significant in the U.N. decision-making process as in a legislative body, or that these variables do not model essential factors of the referent system. Rollcall voting appears to have been more influenced by nation-state predisposition factors than by the communication or caucusing factors included in the model.

These simulation runs suggest that the legislative norms programmed by Cherryholmes and Shapiro are not highly applicable to the prediction of U.N. decision-making process. However, the predisposition characteristics of nation-states included in the model suggest some relationship to U.N. voting behavior. In order to pursue further these predisposition characteristics, it was decided to turn to contemporary literature analyzing nation-state foreign policy decision-making rather than United Nations voting behavior exclusively. The analysis of this



literature may permit a refinement of the predisposition factors to be included in the model and possible use of previous quantitative research to permit weighting of these factors.

### **Revised U.N. Model Based on Foreign Policy Attributes**

**PREDISPOSITION PHASE:** The second model attempt is based upon the hypothesis that national attributes may be related to both United Nations and foreign policy output. An attribute is defined as a characteristic or as a descriptor. Foreign policy studies assume that the attributes of one nation are comparable to those of another, and that the differences between national attributes are susceptible of measurement. For example, we might state that the GNP of the United States is greater than that of Sweden, which is in turn, greater than that of Liberia.

The number of different attributes that might be included in the model is staggering. To group or type them is an essential step of clarification or explication for the model. In attempting attribute analysis, the Rosenau study was considered. In developing his "pre-theory," Rosenau argues that "all foreign policy analyses either explain the external behavior of societies in terms of five sets of variables, or . . . their explanations can be recast in terms of the five sets." The five sets, in their most recent form are here discussed in relation to national attributes:

1. **IDIOSYNCRATIC** includes the area of personal characteristics and perceptions of national leaders, which will be excluded from the model since characteristics may change too frequently for time study of U.N. voting.
2. **GOVERNMENTAL/POLITICAL SYSTEM** variables contain such attributes as governmental stability and degree of democratization. Data for this variable is derived from the Banks and Textor study, *A Cross-Polity Survey*.
3. **SOCIETAL** variables include economic development, religious attachment, and educational level. The Banks data deck provides economic characteristics for 124 countries over a ten year period.
4. **EXTERNAL** variables cover trade, communications, and similar elements. *The Direction of Trade Annual*, published by the International Monetary Fund as well as the Alger diplomatic flow data deck are employed.
5. **SYSTEMIC** variables are, for example, geographic region or the number of borders. Number of borders is excluded since present studies have already shown little or no relationship to foreign policy behavior.

### **Decision-making literature**

Research concerning identification of predisposition attributes and their relationship to foreign policy decision-making are numerous in the field of quantitative international politics. For example Rummel, in a 1963 study, compared dimensions of conflict behavior with and between nations using nine domestic and thirteen foreign conflict variables. Seventy-seven nations were analyzed covering the years 1955-57. Factor analysis and multiple regression results suggested that foreign and do-

mestic conflict behavior are not generally related to and cannot generally be predictors of each other. In a second study using data from the same time period for sixty-nine nations, some relationship was detected between foreign conflict behavior and internal subversion, when demographic conditions were taken into account.

Jonathan Wilkenfeld engaged in a "re-evaluation" of Rummel's data in an effort to identify any relationships which may have been previously obscured. Wilkenfeld found positive association between foreign conflict behavior and domestic subversion, revolution, and turmoil factors for nations in different political groups.

In 1969 Tanter tested the hypothesis that political system attributes increased the relationship between external behavior and attributes which indicate "status inconsistency" of nation. He concluded that the regressions are "only moderate and may not yet warrant accepting them as confirming the . . . hypothesis."

In a 1965 study Arthur Banks and Phillip Gregg associated political variables such as leadership and consensus with types of foreign conflict behavior in a factor analysis of sixty-eight variables for seventy-seven nations.

Given the negative results from this research, a second group of researchers has tested the hypothesis that patterns of foreign policy output can be related to non-behavioral attributes. Aid or diplomatic representation would be classed as non-behavioral interactions. Skrein describes them as facts about what nations do and continuous phenomena rather than as events. Charles A. McClelland and Gary D. Hoggard summarize transactions as items of action that have at some point in time become so numerous, so commonplace, and so normal that they are accounted for in an aggregated form. They conclude that interactions are action items of a non-routine, extraordinary, or newsworthy character that in some clear sense are directed across a national boundary and have, in most instances, a specific foreign target. Charles McClelland and Robert A. Young in 1969 undertook a factor analysis of four years of WEIS data to identify underlying dimensions of behavior. The behavior of the sixty most active international actors were reduced to three fairly distinct dimensions composed of the twenty two types of behavior coded by the WEIS project. The McClelland-Young analysis was repeated for eighty-six national actors over the forty month period. The results yielded the same factors as the McClelland-Young analysis. The percent of all international behavior at the "interaction" level that is associated with either the dimensions of Non-Military Conflict or Military Conflict was used to construct a conflict score. This measure is intended to identify how much of any nation's behavior falls into one of the two conflict dimensions.

### **PREDISPOSITION PHASE:**

In devising the predisposition phase of the model, the selection of attributes based upon foreign policy decision-making literature was difficult. Attribute numbers are almost infinite, and their relation to decision-making is tentative or of limited correlation. The Karl Deutsch re-



search principle of economy and getting "the greatest amount of useful information from the smallest body of data" was adopted, and the following variables were chosen for testing:

1. Demographic attributes are frequently employed in decision-making research. Three demographic variables are included: population size and population growth rate taken from the *U.N. Demographic Yearbook*. Borders are excluded since research already shows little relationship.
2. A second group of attributes frequently employed are economic variables. The Banks data deck including GDP, literacy, inhabitants per physician, and consumption of energy for 124 nations are included.
3. The governmental/societal index attempts to provide a scale for what Bruce Russett has termed the complexity and specialization of political institutions or Cutright's concept that a politically developed nation has more complex and specialized national political institutions than a less politically developed nation. For purposes of our model, the Banks and Textor *Cross-Polity Survey* is used to provide governmental/societal indicators.
4. A final set of indicators is transactional, responding to non-behavioral attribute research. These measure different types of national involvement with other countries. The Alger data deck providing diplomatic exchange data and a direction of trade deck containing the five highest trade partners for 124 states are included in this set of indicators.

#### COMMUNICATIONS PHASE:

A third group of foreign policy literature sees external forces as the initiators of behavior and internal factors as mediators of these factors. One general concept designated as a significant mediator between the external environment and the actions of a national actor is "image." For example, Festinger hypothesizes that the effectiveness of communication depends on:

**Whether the recipient attends to it;  
Whether he learns its contents, and;  
Whether he accepts the contents.**

"Attentiveness" also is identified as a relevant variable by a number of authors in the field of political behavior and international relations. Attentiveness is treated either as an intervening variable between impinging forces and action or as a useful indicator even though its sources are ignored.

Bruce M. Russett's work on Anglo-American relations indicates that there is a direct relationship between what might be called the positive attentiveness of one country to the other and the positive actions of one country toward the other (and therefore, perhaps its voting agreement).

Karl Deutsch as a result of a 1956 study concluded that the aspect of politics that is constituted by communication includes "... the areas of attention, of perception, and orientation, of values and evaluation, of goal-seeking and of decision-making."

T. M. Newcomb suggests that an actor's "readiness to respond" to given external situations and events depends

to some extent on the actor's "attraction" toward the objects and subjects of communication.

Hypotheses from these studies suggest that the amount of trade flowing between two nations may be directly related to the amount of attention they devote to each other; and that the amount of high-level government action directed by one nation to another is directly related to the amount of attention devoted.

The Skrein study of United Kingdom transactions suggests that how much action a nation engages in at the "interaction" level, how much trade flows between the United Kingdom and a nation, and how much action at the interaction level is targeted by a nation to the United Kingdom account for 71 percent of the variance in United Kingdom attention across eighty-six nations.

The variables used in the communication phase will attempt to employ the results from the "attention" and "image" studies. The variables included are:

**Direction of trade data  
U.N. caucusing group membership  
The Alger diplomatic trade data deck  
WEIS transaction data**

The use of these attributes from previous foreign policy decision-making studies in constructing the simulation model will permit some testing of whether these attributes are applicable to U.N. decision-making behavior; and which, if any, of these attributes serve as better predictors for U.N. voting behavior.

The attributes included in the predisposition and communication phases will be correlated to previous voting coalition analysis. Two hundred and twenty General Assembly rollcall votes were analyzed for the period 1960-1965 for the 114 member nations of that period, using the Rice-Beyle method. This method analyzes a sample of rollcall votes by plotting the pair agreement of all members of the body to be studied. Indices of agreement which exceed a certain arbitrary percentage selected as a standard for voting cohesion are noted and patterns of voting agreement indicated. Rice and Beyle differed somewhat on their agreement indices. Beyle indicated maximum cohesion at 100.00 and used an index of 0.0 to 100.00 to represent the degree to which unity was approached. Rice employed a percentage of agreement index. Cohesion was indicated by the percentage of roll call votes on which two members voted alike. In the Dodge study, an arbitrary index of cohesion was placed at 66.66 and above. Using these Rice-Beyle cohesion percentages for the 1960-1965 period, each attribute listed in the predisposition and communication phases will be analyzed for possible relationship to high or low voting cohesion in the U.N.

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## APPENDIX A

### Predisposition and Communication Code Book

#### Original Model for Rollcall Prediction

| I.B.M.<br>card column | Variable                     | Code Numbers—explanation  |
|-----------------------|------------------------------|---|
| 1-3                   | Nation identification number | 0-126 Found in alphabetical listing of the nations.   |
| 4-5                   | skip                         | skip  |
| 6-7                   | geographic region            | 01 South America<br>02 Central America<br>03 North America<br>04 West Europe<br>05 East Europe<br>06 Oceanic<br>07 Mideast<br>08 Southeast Asia |



| I.B.M.<br>card column | Variable                                       | Code Numbers—explanation  |
|-----------------------|--|---|
|                       |  | 09 Oriental   |
|                       |  | 10 North Africa   |
|                       |  | 11 Central and South Africa   |
| 8                     | socio-cultural region                          | 1 Afro-Asia   |
|                       |  | 2 Western Community   |
|                       |  | 3 Latin America   |
|                       |  | 4 Semi-Developed Latins   |
|                       |  | 5 Eastern Europe  |
|                       |  | 0 Unclassified  |
| 9                     | Cold War Position                              | 1 West  |
|                       |  | 2 East  |
|                       |  | 3 Third World   |
|                       |  | 0 Unclassified  |
| 10                    | Colonialism                                    | 1 Colonial Power  |
|                       |  | 2 Anti-Colonial State   |
|                       |  | 3 Other   |
| 11                    | Economic Development<br>Status                 | 1 High  |
|                       |  | 2 Medium  |
|                       |  | 3 Low   |
|                       |  | 4 Very Low  |
|                       |  | 0 Not classified  |
| 12-13                 | ideological factor #1<br>(peaceful settlement) | 00-99   |
| 14-15                 | ideological factor #2<br>(self-determination)  | 00-99   |
| 16-17                 | ideological factor #3<br>(collective measures) | 00-99   |
| 18-19                 | ideological factor #4<br>(social human)        | 00-99   |
| 20-31                 | skip   | skip  |
| 32-33                 | caucus group 1                                 | 01 Afro-Asia  |
|                       |  | 02 African  |
| 34-35                 | caucus group 2                                 | 03 Brazzaville Conference   |
|                       |  | 04 Casablanca Conference  |
| 36-37                 | caucus group 3                                 | 05 Asian Group  |
|                       |  | 06 SEATO Cluster  |
| 38-39                 | caucus group 4                                 | 07 Non-aligned care   |
|                       |  | 08 Arab Group   |
|                       |  | 09 Latin American   |
|                       |  | 10 Western European<br>and Other States   |
|                       |  | 11 Benelux  |
|                       |  | 12 Scandinavian Group   |
|                       |  | 13 Communist Bloc   |
|                       |  | 14 Commonwealth   |
| 40-42                 | greatest trading partner                       | 111-126 (partner's ID number)   |
| 43-47                 | % trade with greatest<br>partner               | .0000-XX.XX<br>(four numbers and decimal point)<br>e.g. .5643<br>3.145<br>33.67 |
| 48-50                 | 2nd greatest<br>trading partner                | 000-126   |
| 51-55                 | % of trade with<br>2nd partner                 | .0000-XX.XX   |
| 56-58                 | 3rd greatest<br>trading partner                | 000-126   |
| 59-63                 | % of trade with<br>3rd partner                 | .0000-XX.XX   |
| 64-66                 | 4th greatest<br>trading partner                | 000-126   |
| 67-71                 | % with 4th<br>trading partner                  | .0000-XX.XX   |
| 72-76                 | Per Cent of<br>U.N. Budget                     | .0000-XX.XX<br>(four numbers and decimal point)<br>e.g. .0016<br>6.432<br>21.87 |